

Claims:

- 5 1. A circuit for use in a radio transceiver, the circuit comprising modulator means for receiving digital signals for application in combination to control the phase of a carrier to produce a transmission signal for transmission by the transceiver during a transmission mode; and demodulator means for demodulating a received signal during a reception mode to recover from the received signals digital signals representing components of the phase thereof; wherein the demodulator means is coupled to the modulator means to receive therefrom in operation a reference signal indicating the phase of the transmission signal whereby the demodulator means can during the reception mode recognize in the received signal being demodulated the phase applied in the transmission mode thereby to facilitate separation of signal from noise.
- 10 2. The circuit according to claim 1 wherein in operation the phase of the transmission signal and of the received signal is applied and extracted as a combination of digital in-phase and quadrature-phase modulations of the carrier.
- 15 3. The circuit according to claim 2 wherein in operation the phase is determined by a combination of digital values which are a set of  $2^n$  values, where  $n$  is at least 1.
- 20 4. The circuit according to claim 1 wherein in operation the received signal provided to the demodulator means comprises a signal derived from the transmission signal produced by the modulator means after being incident on a surface of interest.
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5. The circuit according to claim 1 and further comprising a digital signal processor coupled to the demodulator means whereby the digital signals recovered by the demodulator means are provided to the digital signal processor.

6. The circuit according to claim 5 and wherein the digital signal processor is operable to recognise characteristics of the digital signals which indicate that the received signal which has been demodulated is derived from the transmission signal.

7. The circuit according to claim 6 and wherein the recognition by the digital signal processor provides an authentication that the received signal is from a reflecting surface of interest.

8. The circuit according to claim 1 wherein the demodulator means operates in a direct or homodyne mode using the transmission signal as its local oscillator signal.

9. The circuit according to claim 1 wherein the demodulator means operates in a heterodyne mode and the circuit further comprising a mixer means coupled to receive the received signal and coupled to receive a signal representative of the transmission signal and to provide an output signal which is deliverable to the demodulator means.

10. The circuit according to claim 9, and further comprising a frequency divider to which an output from the modulator means is applied, wherein the signal representative of the transmission signal is frequency divided from that signal.

11. The circuit according to claim 10, wherein the signal representative of the carrier transmission signal has a frequency which is substantially half that of the carrier transmission signal.

5 12. A radio transceiver incorporating the circuit according to claim 1.

13. The transceiver according to claim 12 and which further comprises a pulse generator for transmitting the transmission signal as one or more pulses according to a predefined pulse characteristic.

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14. The transceiver according to claim 12 and further comprising an antenna and a switch which is operable to couple the antenna to a transmit circuit incorporating the modulator means during the transmission mode and to couple the antenna to a receive circuit incorporating the demodulator means during the  
15 reception mode.

15. A method of inspecting or authenticating a surface of interest which comprises irradiating the surface with a radio signal which is produced from the transmission signal produced by the transceiver according to claim 1 and  
20 analysing a signal returned from the surface as the received signal received by the transceiver.